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AN INOCERAMID-LIKE LIMID OF LATE MAASTRICHTIAN AGE FROM MAASTRICHT

BY

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(With one plate)

Key-words : *Limidae*, Bivalvia, Cretaceous, Belgium - the Netherlands.

ABSTRACT

An incomplete, large pteriomorph-bivalve of Late Maastrichtian Age, described by GOLDFUSS (1835) as *Inoceramus nobilis* is critically redescribed as *Ctenoides vogeli* nomen novum. The palaeoecological implications of endemic species present in the Late Maastrichtian calcarenites of the Sint Pietersberg area (Maastricht, the Netherlands) are discussed.

RESUME

GOLDFUSS (1835) a décrit sous le nom de « *Inoceramus nobilis* » un bivalve ptériomorphe incomplet du Maastrichtien supérieur. Cette espèce est redécrite comme *Ctenoides vogeli* nomen novum. Les implications paléoécologiques des espèces endémiques retrouvées dans les calcarénites du Maastrichtien supérieur de la Montagne Saint-Pierre (Maastricht, Pays-Bas), sont discutées.

(1) Contribution 19 to the study of the faunas of Late Cretaceous Age from Limburg (see addendum p. 7).

ZUSAMMENFASSUNG

GOLDFUSS (1835) hat ein unvollständiges Exemplar eines Pteriomorphe-Bivalven Art aus dem Ober-Maastrichtium, beschrieben unter dem Namen « *Inoceramus nobilis* ». Dieser Art wird kritisch neubeschrieben, als *Ctenoides vogeli* nomen movum. Die paläoökologischen Folgerungen, mit der Anwesentheit von endemischen Arten in den obermaastricht Calcareniten des Sint-Pietersberges (Maastricht, Niederlände) verbunden, werden diskutiert.

INTRODUCTION

The E N C I quarry in the Sint Pietersberg near Maastricht (Limburg, the Netherlands) is the type area for the Maastrichtian Stage (terminal Cretaceous). The deposits are calcarenitic, but are often called « tuffaceous chalks » (after the Dutch : « tufkrijt ») and are of Late Maastrichtian Age (*Belemnitella junior* and *Belemnella kazimiroviensis* Zones). The Sint Pietersberg area and numerous quarries in the area around Maastricht have yielded an exceptionally rich fauna which, probably because of its spectacular Reptiles (mainly mosasaurs and turtles), has attracted the attention of collectors and palaeontologists since the 18th century. Vertebrates, invertebrates and more recently microorganisms have been described monographically (list of those papers in DHONDT, 1979, p. 142). Bivalve molluscs are an important part of the total fauna; among the many species known from the Maastricht area a few are apparently endemic.

These species were already described before or by GOLDFUSS (1833-1836) and yet were not recorded from other regions afterwards.

In an attempt to reidentify the total bivalve fauna I have listed (unpublished data) part of the pteriomorphs : *Pinnidae*, *Pteriacea*, *Pectinacea*, *Limacea*, *Ostreacea*. For these groups 67 species have been recognised of which four are possibly endemic : *Pteria approximata* (SCHOLTHEIM, 1813), *Isognomon triptera* (BRONN, 1827), *Lima muricata* GOLDFUSS, 1835 and *Ctenoides ? vogeli*, nomen novum (= *Inoceramus nobilis* MÜNSTER in GOLDFUSS, 1835).

Those endemic species are only a fraction of the total fauna, yet their ecologic importance cannot be ignored. In this paper *Ctenoides ? vogeli* shall be redescribed and the implications of its probable evolution discussed.

TAXONOMIC AND NOMENCLATIVE NOTE

In *Petrefacta Germaniae* (GOLDFUSS, 1835) two different *Inoceramus nobilis* species were described and figured : one from the Lias of Falkenhagen (p. 109, pl. 109, fig. 4) and another one « e creta tophina montis St. Petri ». The species from Maastricht lacks any trace of prismatic shell structure and is certainly not an inoceramid. In general aspect, however,

it looks somewhat like a *Mytiloides* species and GOLDFUSS's generic attribution is understandable. Specimens more completely preserved than that figured by GOLDFUSS show clearly that the species has many similarities to Cretaceous limids generally classified as *Ctenoides* MOERCH 1853, such as *Lima tecta* GOLDFUSS, 1853, *Lima divaricata* DUJARDIN, 1835, *Lima goupilii* POTIEZ and MICHAUD, 1844, *Lima rapa* d'ORBIGNY, 1847. I agree with BOSQUET, 1860 and VOGEL, 1895 that this « *Inoceramus nobilis* » is a limid and tentatively classify it as *Ctenoides ? vogeli* nom. nov.

SYSTEMATIC DESCRIPTION

Phylum MOLLUSCA, Classis BIVALVIA, Subcl. PTERIOMORPHIA, Ordo PTERIOIDA, Subordo PTERIINA, Superfamilia LIMACEA, Familia LIMIDAE

Genus Ctenoides MOERCH, 1835

(type species *Ostrea scabra* BORN, 1778, S. D. STOLICZKA, 1871)

Ctenoides ? vogeli nom. nov.

(pl. 1, figs. 1 and 4)

. 1835 *Inoceramus nobilis Münster* — A. GOLDFUSS, p. 117, pl. 113, fig. 3;
v . (1860) *Lima nobilis* Bosq. — J. BOSQUET, p. 384;
v . 1895 *Lima nobilis* Münst. Spec. — F. VOGEL, p. 18, pl. 1, fig. 12.

Type material: The type specimen of GOLDFUSS was destroyed during the 1939-45 war. The specimen (ST 13550) figured by VOGEL which is kept in the Museum voor Geologie en Mineralogie in Leiden (the Netherlands) is selected as neotype.

Locus typicus : Sint Pietersberg near Maastricht, Limburg, the Netherlands.

Stratum typicum : « E creta tophina » (« Tuffkreide ») : Late Maastrichtian, Cretaceous.

Original description

Inoceramus nobilis Münster

Inoceramus testa ovata convexo-plana, lateribus infra unbonem subdeclivibus, umbonibus medianis, costis concentricis angustis lineisque nonnullis interstitialibus remotis regularibus, striis radiantibus obsoletis.
E creta tophina montis St. Petri . M. M.

Dieses Bruchstück einer Schale aus dem Kreidetuff von Mastricht ist ebenfalls sehr flach, wölbt sich jedoch nach oben etwas mehr, und ist hier an den Seitenrändern steiler abfallend. Der Umriss scheint eyförmig zu seyn. Schmale, convexe, in regelmässigen Kreisabschnitten verlaufenden Rippen und einige schwächere Linien zwischen ihnen geben der Schale ein zierliches Ansehen. Sie sind von zahlreichen, sehr verwischten ausstrahlenden Linien durchkreuzt, welche kaum noch bemerkt werden können. Die obere, sehr dünne Schalenlage hat sich erhalten, und die untere ist so dicht, dass ihre faserige Structur nicht deutlich erkannt werden kann.

Additional description

Number of specimens studied : 21

KBIN Brussels : 12 (none complete).
Museum voor Geologie, Leiden : 4 (none has complete auricles; also some doubtful fragments).
Natuurhistorisch Museum, Maastricht : 5 (none complete).

Measurements

Height : from 57 to 210 mm; average 120 mm (n = 16).
Width : from 40 to 135 mm; average 84 mm (n = 15).
Umbonal angle : 72° to 87°, average 81° (n = 6).

Description

Diagnosis : Ovate, slightly opisthocline, large compressed and biauricular limid species with lamellar conmarginal ornamentation.

Ornamentation :

1. conmarginal ornamentation :
   - — in young stages : strong growth threads of equal development at more or less regular intervals;
   - — when H = 2 - 3 cm, some growth threads are more strongly developed than the others; in this growth stage every second thread is more strongly developed;
   - — when H = 6 - 7 cm only about every third or fourth growth thread shows strong development; it becomes a lamellar, conmarginal structure and towards the margins the lamellae are placed more closely together;
2. radial sculpture : fine, radial grooves, often only faint, are present especially in young stages.

Auriculae :

none of the specimens has complete auricles, which were probably subequal on both valves; the conmarginal ornamentation continues virtually without interruption onto the auricles.

Umbonal hinge :

not seen; the hinge line was probably almost straight.

Discussion

Systematic characteristics of the species

The number of known specimens of *Ctenoides ? vogeli* is relatively small and all are incomplete. A detailed discussion of the variability and ontogeny in impracticable.

Generic placement

GOLDFUSS's original specimen lacks the umbonal part. The general aspect recalls inoceramids of the genus *Mytiloides* BRONGNIART; however, despite what GOLDFUSS claimed, the prismatic layer (in his text ' faserige Structur ') cannot be seen on any of the specimens I examined. As BOSQUET (1860) pointed out « *Inoceramus nobilis* » from the Maastrichtian « Tuffkreide » is a limid. With its ovate-pointed disc, small auricles, probable byssal gape, combination of radial and conmarginal ornamentation, but absence of real ribs, it has definite similarities to *Lima dunkeri* von HAGENOW, 1842, *Lima tecta* GOLDFUSS, *Lima divaricata* DUJARDIN, *Lima rapa* d'ORBIGNY, five species that could well be considered as a species-group. On GOLDFUSS's Maastrichtian ' *I. nobilis* ', the commarginal structure is predominant, a rare occurrence in *Limidae* (MOORE, 1969, p. N385).

On *Ctenoides* MOERCH, as it is generally described, ribs are present and no conmarginal lamellae due to growth stages can be seen; however, H. VOKES (1973) figures several *Ctenoides* species, of which one, *Ctenoides* (*Ctenoides*) cf. *scabra*, certainly shows strong conmarginal growth interruptions (VOKES, 1973, p. 91, pl. 1, fig. 2). The Late Cretaceous species-group has clearly developed growthlines and real ribs are never present; the shell surface is divided by shallow grooves which separate spineless rib-like areas. If it were not for the affirmation of COX, (1942, p. 180) that *Antiquilima* became extinct in the Bajocian, I would rather consider the Late Cretaceous species-group as belonging to this Jurassic genus : *Antiquilima* has conmarginal growth stages and thread-like ribs. I prefer to consider the Cretaceous species-group as a probable morphologic intermediate between *Antiquilima* and *Ctenoides*.

EVOLUTION AND ECOLOGICAL ASPECTS

Among the Late Cretaceous species of the *Ctenoides ?* species-group, *Ct ? vogeli* is highly specialised towards a vagile mode of life. It is the largest, most compressed and most strongly conmarginal ornamented species. Its young ontogenic stages and small specimens show relatively strong similarities to *Ct ? tecta* GOLDFUSS (in shape and ornamentation)

(pl. 1 fig. 3) also occurring in the Late Maastrichtian deposits at Maastricht. *Ct ? vogeli* almost certainly evolved from the more generalized *Ct ? divaricata — tecta* lineage. The functional changes of this « extreme » limid-species are difficult to interprete. Among recent *Ctenoides* species, *Lima hians* (GMELIN) was stated by TEBBLE (1976, p. 66) to live in « ... low water to 55 fathoms on coarse sand, gravel, broken shells and stones »; and according to STANLEY (1970, p. 25) *Lima scabra* (BORN) « ... hangs loosely in a variety of positions ... » and « ...swims ...between rocks and coral colonies ... ». The organo-detritic, fairly coarse calcarenites of Sint Pietersberg area were probably well suited for *Ctenoides* species.

The extreme flattening of the discs and size increase seen in *Ct ? vogeli* cannot be explained as a further adjustment to this calcarenitic environment and looks more like an adaptation towards a more vagile mode of life.

It is tempting to stress that in Late Maastrichtian times inoceramids became virtually extinct (DHONDT, 1983) and this inoceramid-like, large, flattened limid could have evolved towards the niches left vacant by the disappearance of *Platyceramus* HEINZ in the Early to Middle Maastrichtian. If this hypothesis is correct, it means that *Ctenoides ? vogeli* swam around more freely than the species of the *Ct ? divaricata-tecta* lineage.

Pteria approximata (SCHLOTHEIM), figured in GOLDFUSS, 1835, pl. 118, fig. 7, *Isognomon triptera* (BRONN), figured in GOLDFUSS, 1835, pl. 118, fig. 8, *Lima muricata* GOLDFUSS, 1835, figured on pl. 105, fig. 4, and *Ctenoides ? vogeli* n.n. are endemic to the Maastrichtian type-area, to the deposits to the W of Maastricht along the Albert-Kanaal and the Meuse-River and to the deposits to the E of Maastricht such as Geulhem, Valkenburg and Kunrade.

Lima muricata, with strongly developed spines, is comparable to *Lima lima*. *Pteria approximata* is larger than *Pteria colymbus* whose mode of life was described by STANLEY (1970, p. 32, pl. 11, figs. 1-4, p. 136) and WALLER, (1973, p. 45), but was certainly as mobile if one takes its slender shape into account. *Isognomon triptera* is a very elongated species, with an almost *Malleus* -like shape. The specimens known from Maastricht do not show much of the distortion that STANLEY cited (l.c. p. 88) as frequently occurring in this group. These three Maastrichtian species probably lived attached to or under rocks (*Lima muricata*, *Isognomon triptera*) or attached to slender stems of bryozoans or algae (*Pteria approximata*). Similar species are known at present from semi-tropical or tropical reef environments. VOIGT and DOMKE (1955) and VOIGT (1956) have shown the presence of seagrass of probable Mediterranean-tropical affinity in the type Maastrichtian and in the nearby Kunrade Chalk. The sporadic presence of large quantities of seagrass (P. J. FELDER — personal communication — thinks there was an « island of seagrass » near the

Maastricht area) during the Maastrichtian and of occasional boulders in the shallow sea offered the necessary ecological niches for these bivalve species. The environmental interpretation explains the presence of the species, but not their endemism.

The Maastrichtian calcarenites yielded a fauna different from that known from fine-grained deposits of similar age such as the « Schreibkreide » deposits of northern Europe (DHONDT, 1982). Other coarse-grained deposits of Late Cretaceous age are found in Northern Europe in Ivø (Sweden : Campanian-Early Maastrichtian), in the Harz-area (Germany : Santonian-Campanian), in Cotentin : « Craie à Baculites » (France : latest Campanian — Early Maastrichtian), at Saint-Symphorien (Hainaut, Belgium : Early and early Late Maastrichtian). In several Campanian-Maastrichtian coarse-grained deposits faunal components occur which differ from those in the finer sediments, as illustrated by SURLYK and CHRISTENSEN (1974) for Ivø.

The Maastrichtian strata at and near Maastricht are the only coarse-grained deposits in northern Europe of an undisputed Late to latest Maastrichtian age. In this environment organisms that were part of the sessile benthos could have evolved separately and this would explain the observed endemism. Lack of suitable environments elsewhere also limited the migration of the more vagile *Ctenoides ? vogeli.*

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ADDENDUM

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EXPLANATION OF PLATE

PLATE I

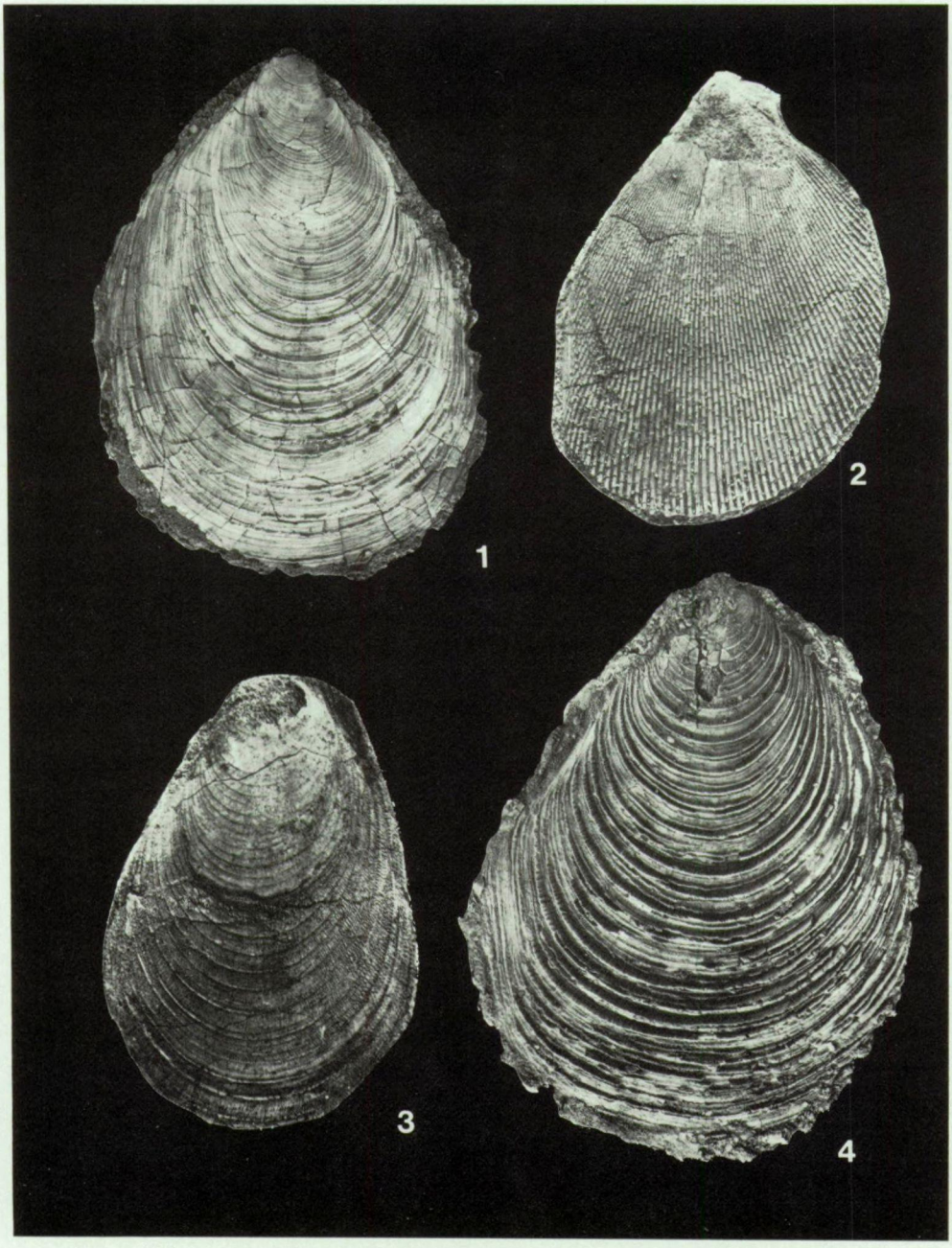
All illustrated specimens are of Late Maastrichtian Age and from the Sint Pietersberg near Maastricht, the Netherlands. At present they are deposited in the type collections of the K.B.I.N.

Fig. 1. — *Ctenoides? vogeli* nomen novum : right? valve, X 0.5, TCMI 10,233 (Bosquet Coll.);

Fig. 2. — *Ctenoides? dunkeri* (von HAGENOW, 1842) : left? valve, X 1.4, TCMI 10,097 (Ubaghs Coll.);

Fig. 3. — *Ctenoides? tecta* (GOLDFUSS, 1833): right? valve, X 1.1, TCMI 10,104 (Bosquet Coll.);

Fig. 4. — *Ctenoides? vogeli* nomen novum : left? valve, X 0.5, TCMI 10,234 (Bosquet Coll.).



A. V. DHONDT. — An Inoceramid-like Limid of Late Maastrichtian Age from Maastricht.